

Spin correlations and Dzyaloshinskii-Moriya interaction in Cs 2CuCl_4

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Abstract

We report on electron spin resonance (ESR) studies of the spin relaxation in Cs_2CuCl_4 . The main source of the ESR linewidth at temperatures $T \leq 150$ K is attributed to the uniform Dzyaloshinskii-Moriya interaction. The vector components of the Dzyaloshinskii-Moriya interaction are determined from the angular dependence of the ESR spectra using a high-temperature approximation. Both the angular and temperature dependencies of the ESR linewidth have been analyzed using a self-consistent quantum-mechanical approach. In addition, analytical expressions based on a quasiclassical picture for spin fluctuations are derived, which show good agreement with the quantum-approach for temperatures $T \geq 2J/k_B \approx 15$ K. A small modulation of the ESR linewidth observed in the ac plane is attributed to the anisotropic Zeeman interaction, which reflects the two magnetically nonequivalent Cu positions. © 2013 American Physical Society.

<http://dx.doi.org/10.1103/PhysRevB.88.174421>
